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NASA TECH BRIEF

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Improved Chemical Vapor-Deposition Reactor

The problem:

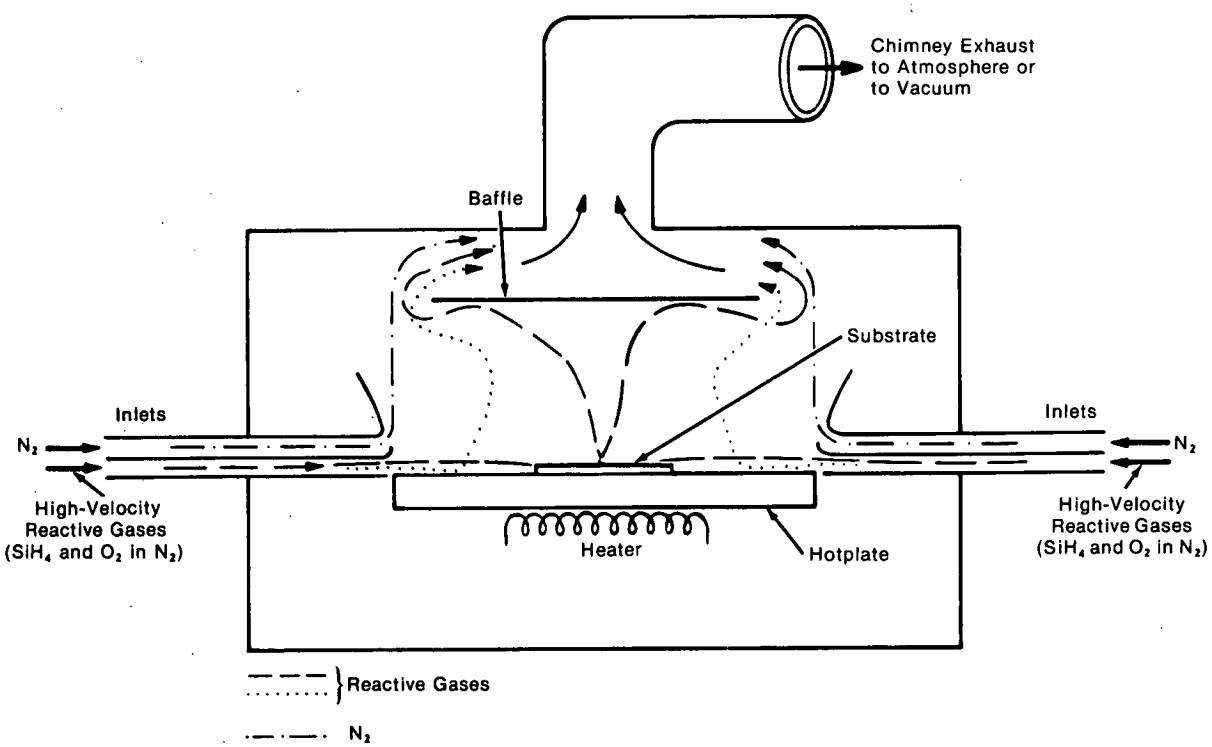
Chemical vapor deposition is used in depositing thin dielectric films on microelectronic components during fabrication. Two basic problems occur during this process. Often the deposited films include large particles in an otherwise finely grained structure. These particles are deposited when the reacted gases are eliminated too slowly by free convection, forming large particles that "snow" onto the substrate. In addition, the films are frequently nonuniform in thickness because of the uneven distribution of incoming reactive gas due to free convection.

The solution:

High-quality thin films can be obtained using a modified vapor-deposition reactor.

How it's done:

The new reactor includes modifications as shown in the illustration. The problem due to free convection is eliminated by actively exhausting the reacted gases. A chimney is used to exhaust the gases directly into the atmosphere or to a vacuum. This prevents the formation of a large particles on the substrate.



Modified Vapor Deposition Reactor

(continued overleaf)

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Effluent gas backflow is prevented by pumping in a curtain of nitrogen above the fresh reactive gases from several directions.

As shown in the illustration, fresh reactive gases are introduced from two diametrically opposite directions with sufficient velocity to flow to the opposite sides of the substrate. These fresh gases replace the components of the reacted gas which have not been extracted in the formation of the film. The even distribution of these gases produces a uniform film thickness.

Several other gas-inlet configurations have been developed for the uniform distribution of the reactive gases. These are even more effective and are described in detail in a report.

Note:

Requests for further information may be directed to:

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Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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Categories: 08 (Fabrication Technology)
04 (Materials)
01 (Electronics - Components and Circuitry)